

Editorial

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Big Data and Healthcare: Building an Augmented World

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Starting from July of 2016, literally bumping into people on the streets trying to catch Pokémon has become a common sight. Pokémon, of course, are fictional creatures based on the popular Japanese video game franchise that has become the basis of animated series and films [1]. Unlike other fictional characters, however, Pokémon now exist in an augmented reality (AR) in the new mobile game, Pokémon Go, which transforms your physical location into a world that hosts characters superimposed on the reality that we see through our smart phones.

Having become an international sensation within days of its release, Pokémon Go integrates fiction-based excitement into our physical reality. What makes this location-based game possible is global positioning system (GPS) technology, a major staple of big data. GPS allows data to be collected (as in Google maps) while allowing this collection to be added upon by crowd-sourced data [2]. In our field, of course, the question naturally arises: Could this game phenomenon be a precursor to an integration of similar technologies into healthcare somewhere down the road?

Since the beginning of the so-called “4th industrial revolution” that started in the middle of the last century, we have seen digital advances in almost every field. This revolution has brought about increases in storage capacity, processing power, and access to knowledge, all of which are concepts associated with big data [3]. Gartner Inc. has predicted five

technologies for big data in 2016—machine learning, artificial intelligence, the Internet of Things, automated composition engines, and robo-boss [4]—technologies not only made possible by big data but also used to create more big data. As healthcare is a field in which much interest has been directed toward big data and its utilization, business entities have been working diligently to break and develop new ground in this field. In February of this year, for instance, IBM Watson Health, one of the most well-known examples of the integration of big data and machine learning into healthcare, announced that it would buy Truven Health Analytics, a cloud-based healthcare data and analytics company, a move that would make IBM’s health cloud the largest and most diverse collection of health-related data in the world [5].

In the 2015 European Commission workshop on Big Data in Health Research: An EU Action Plan, “big data in health” was defined to “encompass high volume, high diversity biological, clinical, environmental, and lifestyle information collected from single individuals to large cohorts, in relation to their health and wellness status, at one or several time points” [6]. Interest in the application of big data in healthcare has been seen around the world, perhaps most noticeably in the 100,000 Genomes Project in the UK [7] and the NIH Big Data to Knowledge and Precision Medicine Initiatives in the United States [8,9]. China has also recently announced plans to develop a big data platform that will be able to cover the entire life cycle [10]. Such exemplary initiatives ambitiously envision collecting various forms of health data that include structured data (e.g., genotype, phenotype, and genomics data) as well as semi-structured and unstructured data (e.g., medical imaging, Electronic Health Records,

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lifestyle, environmental, and health economics data) [6].

These advances in big data analytics have naturally transformed our question of “What has happened?” (descriptive) to “What could happen?” (predictive) and “What should we do then?” (prescriptive) [11]. The growth of these topics can be seen in the biomedical literature. As of July 2016, a PubMed search of articles with “big data” in the title retrieved approximately 900 results published since 2008. The articles cover a broad range, from introductory topics, such as opportunities and challenges of big data in certain areas to more technical topics such as proofs for modeling and simulation [12,13]. Predictive studies, however, have yet to receive adequate attention in the literature [14]. While Health Informatics Research (HIR) has published review papers and editorials regarding big data [15-18] in the past, this issue of HIR includes a review paper [19] that examines the potential of the medical Internet of Things and big data in producing “personalised preventative health coaches,” digital health advisors that can analyze the implications that big data has for the health and well-being of individuals.

With big data now a buzzword in scholarly papers, reports, news articles, and blogs, we realize that implementing the promises of big data into the world of healthcare is easier said than done. The conversion of big data into applicable knowledge requires moves to be taken on various fronts [6]. To make data sharing possible from various sources and in various formats, standards for data generation and processing must be adopted to ensure the data’s interoperability [6,20]. Ethical and legal processes must be established to prevent the abuse of personal information [6,21]. We must also focus on leveraging the productivity of big data projects by including interdisciplinary workforce training, as more bio/health informaticians, biostatisticians, and computational scientists will join teams for research, clinical practice, and health administration [6].

A seamless integration of big data into our healthcare system may seem to lie still in the distant future. In spite of the buzzword “big data” has become, the work of researchers from both academia and industry has thus far focused more on the collection rather than application of data, and we have seen few tangible integrations in the real world, let alone the healthcare industry. But the few integrations we have seen, as in fields such as gaming, integrations that seemed like science fiction only ten years ago, invite us to imagine the world of possibilities they can bring. The foundations of this world have been set, and it is our job to build upon them.

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